

2 Background

This section presents an overview of current conditions at the site, including the natural and built environment, historical information, and key environmental conditions. The objective is to present the information on the affected environment pursuant to the requirements of SEPA (WAC 197-11-440(6)) as well as MTCA. The goal is to present an integrated site description intended to avoid duplication and delay, as specified in WAC 197-11-250 to 268. Significant elements of the environment identified in the Determination of Significance are included, as are key elements of the natural and physical background environment pertaining to the MTCA FS.

2.1 Town and Site Description and History

This section first describes the Town of Skykomish, Washington, and then locates the site within the town. It is important to not only understand the layout of the site, but also the town because the alternatives for cleanup of the Former Maintenance and Fueling Facility will impact areas of the town that are not on BNSF property. In addition to describing the town and site, the operational history of the Former Maintenance and Fueling Facility is also summarized. Sections 2.2 and 2.3 describe the natural and built environment of the town and the site.

2.1.1 Town Description

Historically, Skykomish was the commercial center of the Upper Skykomish Valley. The Town of Skykomish was incorporated in 1909, and mining, lumbering, milling, and the railroad were its economic mainstays. In 1929 the town had a population of 929, but it has since declined to its current level of 214 (U.S. Census Bureau, 2001). It is estimated that seasonal residents bring the total population to between 250-300 people (Blanck, 2003). Skykomish is located in King County, Washington at an altitude of 950 feet above mean sea level (msl).

In 1893, train service to Seattle started along the Great Northern Railroad (GNR), and the Town of Skykomish became a center for railroad operations, including a roundhouse, turntable, and electrical generating substation. Active railyard operations in Skykomish had ceased by 1974. The BNSF railroad still runs through town, but railyard activities are limited to track maintenance and snow removal. The railroad continues to be a BNSF main transcontinental route with approximately 24 trains passing through Skykomish daily (Yates, pers. comm., 2003a).

Skykomish was built near the mouth of Maloney Creek where it connects to the South Fork of the Skykomish River. Maloney Creek was diverted from its original course in approximately 1912, and many channel modifications have

occurred since then (USFS, 1991). The original course of Maloney Creek was located along the southern boundary of the railyard, and developed into a marshy area collecting stormwater drainage from the railyard and the southern part of town. This area is marked on Figure 2-1. The current course of Maloney Creek runs south of town.

To protect the town from flooding from the Skykomish River, the United States Army Corps of Engineers (USACE) constructed a flood control levee in 1951 along the riverfront east and west of the Skykomish Bridge, which was built in 1939. The levee is marked on Figure 2-1.

No logging or mining activities are ongoing in the Skykomish area. The town is surrounded on all sides by the Snoqualmie-Mount Baker National Forest (Figure 1-1). This portion of the National Forest is in Management Area 27-SF, part of which is Scenic Forest. Scenic Forest is managed to enhance viewing and recreational experiences (USFS, 1990 and USFS/USDI BLM, 1994.)

Today the town is dependent on tourism and on the Forest Service maintenance yard and ranger station. The other major employer is the Skykomish School District.

2.1.2 Site Description

The BNSF Former Maintenance and Fueling Facility in Skykomish, Washington, operated from the inauguration of the GNR line to Seattle in 1893 until 1974. The railroad line still runs through the facility, the property of which is owned by BNSF. The historical activities at the facility resulted in a release of hazardous substances that has impacted the railyard, adjacent properties, and natural features in the area such as the former Maloney Creek channel. The affected areas subject to potential cleanup action, whether BNSF property or otherwise, are collectively referred to as “the site” in this FS/EIS. BNSF’s property is referred to as “the facility” and “the railyard.” Figure 2-1 shows the general layout and boundaries of the site and the facility. The site covers approximately 40 acres, and the facility covers approximately 22 acres.

For purposes of this FS/EIS, the site is defined by contamination detected in soil, sediment, or groundwater samples exceeding the levels below. Boundaries were adjusted to avoid cutting through properties as much as possible. The precise boundaries may be adjusted based on additional sampling that will occur during remedial design and compliance monitoring, after a final cleanup action is selected. The outline contains all areas with:

- Greater than 0.5 milligrams per liter (mg/L) of total petroleum hydrocarbons (TPH) as diesel (by NWTPH-Dx Method) in

groundwater. TPH-oil (by NWTPH-Dx method) was not detected in groundwater and therefore, no allowance was made for TPH-oil in the outline.

- Any presence of free product
- Soil exceeding 20 milligrams per kilogram (mg/kg) for arsenic and 250 mg/kg for lead
- Soil TPH-Dx exceeding 50 mg/kg

The site has been subdivided into several distinct Cleanup Zones (based on RI and Supplemental RI sampling) for this FS/EIS (see Section 6 for further discussion of Cleanup Zones):

- 1) **The Railyard Zone.** This area includes the former maintenance facility, together with two small adjacent areas, and covers approximately 22 acres. It has historically been used for industrial purposes. Surface and subsurface impacts are present.
- 2) **The Developed Zones.** These areas are or are likely to be developed for residences, commercial buildings, public buildings, or roads. These areas are primarily affected by contaminants in groundwater and surrounding subsurface soil. Hydrocarbon plumes consisting of a mixture of diesel and bunker C affect the NW Developed Zone and the South Developed Zone (Figure 2-1). The NE Developed Zone is affected primarily by diesel. In addition, there are some isolated elevated occurrences of lead in the surface soil north of the railyard.

Diesel oil is a complex combination of hydrocarbons, having carbon numbers predominantly in the range of C9 to C20. The formulation and composition of diesel varies according to its intended use. There are two main types of diesel; these are Type 1 (kerosene and marine fuel) and Type 2 (automotive and locomotive fuel). Diesel fuel generally contains low concentrations of PAH compounds.

The composition of Bunker C fuels is less consistent than that of diesel fuel. Bunker C represents a fuel mixture which generally contains both diesel-range (C9 to C24) and oil-range (C20 to greater than C32) hydrocarbons. Bunker C fuels generally contain higher concentrations of PAH compounds than diesel fuels. The viscosity of Bunker C is higher than that of diesel and when the two types of hydrocarbon are present together they form an emulsion.

- 3) **The Aquatic Resource Zones.** There are two Aquatic Resource Zones. The Skykomish River and Levee includes the flood control levee downgradient of the NW Developed Zone, and the interface between land and the Skykomish River. This area is affected by seepages of hydrocarbon reaching the river. The second Aquatic Resource Zone is the former Maloney Creek channel. This area occupies a wetland area centered around the former Maloney Creek channel, which now functions as a stormwater conduit. This area has impacted surface sediment and also contaminated subsurface (smear zone) soil contiguous with Railyard Zone subsurface soil.

2.1.3 Railyard Operational History

As mentioned above, the facility was originally owned and operated by the GNR, starting in the summer of 1893. GNR owned the property from the late 1890s until 1970 when GNR merged with four other railroads and became the Burlington Northern Railroad (BNRR). The facility is currently owned and operated by BNSF that was formed with the merger of BNRR and the Santa Fe Railway in 1994.

A detailed history of the facility has been conducted (Berryman, 1990). The facility has gone through five overlapping operational eras. Each era is discussed below in terms of the activities conducted and the products used during the era. Figure 2-2 shows the location at the facility of the major elements discussed below.

2.1.3.1 Coal and Steam Era

Steam produced by coal heat was used to power locomotives operating out of the facility during this era. Structures reportedly present during this time period included an engine house and turntable, sandhouse, blacksmith and machine shop, coal tower and chute, depot, and water tower. The engine house originally had nine stalls for repair work but, by 1902, only six stalls were being used. Each stall had a pit where a repairperson could service the underside of a locomotive.

Repair activities reportedly performed during this era included insulation of engine parts and boilers, cleaning and rebuilding seals, cleaning and repairing boilers, testing gauges, oil and degreasing, painting, and cleaning engine parts. The turntable was used to turn the locomotives around. The sand tower dispensed sand that the locomotives used for traction on steep grades. The machine and blacksmith shops were used to manufacture parts for repairs. Petroleum-related products reportedly used during this period included grease, lubricating oil, and fortnite oil (kerosene-like petroleum product used to clean parts).

2.1.3.2 Oil and Steam Era

Bunker C oil replaced coal as the heat source in steam locomotives in about 1908. An oil-unloading shed and sump and an aboveground oil storage tank replaced the coal tower and chute. Bunker C oil was stored at the facility in below-grade wooden, concrete, and steel sumps, and aboveground steel tanks. Fortnite oil was the only cleaning fluid reported to be used during this period. The depot was moved from the south side of the tracks to its present location north of the tracks on Railroad Avenue.

2.1.3.3 Electric Era

Construction of an 8-mile-long tunnel between Skykomish and Leavenworth and of an electric substation was completed in 1929. Electric-powered locomotives replaced bunker-C oil-powered locomotives through the tunnel to eliminate exhaust fumes. The facility became the transition point for bunker-C-oil- to electric-powered locomotives.

The engine house was used for repairs on both road and helper engines, until it was destroyed by a fire in 1943. However, evidence suggests that some elements of engine repair and maintenance continued at the facility through the mid-1950s.

2.1.3.4 Diesel Era

Diesel was used for locomotives traveling west of Skykomish as early as the mid-1940s and replaced both bunker C oil and electricity. In 1956, installation of a tunnel ventilation system permitted diesel locomotives to operate within the tunnel and electric locomotives were abandoned. The diesel was stored at the facility in aboveground and underground storage tanks until 1974 when BNRR discontinued fuel-handling activities at Skykomish.

2.1.3.5 Maintenance Era

Most engine repair and maintenance activities ceased in the mid-1950s. The electric substation building was used as a sandblasting facility for a period in the 1960s. The sandblasting facility is the probable source of the elevated concentrations of lead in the immediate vicinity of the former substation. BNRR discontinued all fueling operations at their Skykomish facility in 1974. At the same time, they also reportedly excavated and removed all known sources of petroleum product.

The former structures of the facility are shown on Figure 2-2. The substation was demolished in August 1992. The depot building and maintenance building are the only structures remaining at the facility. Three sets of railroad tracks and at least four spur lines surrounded by railroad ballast and gravel make up the remainder of the facility, which is currently used as a base of operations for track maintenance and snow removal crews.

2.2 Natural Environment

This section describes the natural environment of the Town of Skykomish and the site. The intention of this section is to describe the earth (geology, soil, and sediments) that exists under and around the town and site in order to understand the potential migration of contaminants through the earth (Section 2.2.1) and the impacts cleanup actions may have on the natural environment (Section 7).

Contaminants can potentially migrate through, and over, the earth via groundwater flow, surface water flow, stormwater runoff and infiltration, and floods. As such, to determine the movement of surface water and groundwater, one must first understand the soil environment (Section 2.2.1). Then one can understand how the soil either facilitates or limits the movement of water both horizontally and vertically. Some of the alternative cleanup actions will significantly impact the soil and amount of water within the soil. Thus, the next aspects of the natural environment that will be described in this section are water (Section 2.2.2) and air (including wind) (Section 2.2.3).

Finally, we will describe the plants, animals, and aquatic life that exist on and around the town and site to determine which ones may be impacted by the contamination (Sections 2.2.4 to 2.2.6). Potential impacts to the natural environment as a result of cleanup actions are discussed in Section 7.

The human (or built) environment of the town and site is described in Section 2.3. This includes features such as buildings, roads, bridges and railyard facilities. Adverse impacts to the built environment are described in Section 7.

2.2.1 Earth

This section describes the geology, soils, sediment, topography, and unique physical features of the town and the site.

2.2.1.1 Geology and Soils

The Former Maintenance and Fueling Facility is located in the Skykomish Valley on the southern bank of the Skykomish River in Washington State. The Skykomish Valley is a classic, glacially scoured valley with steep sidewalls and a relatively flat bottom. The Skykomish River, flowing from east to west adjacent to the site, now occupies the northern side of the valley at the railyard. Over geologic time, the river has meandered from the north side of the valley to the south side of the valley, as evident in the riverine deposits that dominate the geology on the valley floor.

The Skykomish River receives its water from small tributaries upstream and spring snowmelt. Further downstream from the site, the Skykomish and

Snoqualmie Rivers merge and form the Snohomish River, which flows into Puget Sound at Everett, Washington.

The Town of Skykomish is primarily underlain by highly heterogeneous glaciofluvial sediments. These glaciofluvial sediments consist mainly of sand and gravel, and underlie a generally thin layer of topsoil and/or fill. Figure 2-3 presents a typical cross section through the site that illustrates the variability of the soils underlying the site.

Sandy topsoil up to 4 feet thick is present throughout residential and commercial areas within the site. The topsoil is loose to medium dense, and consists of gravelly or silty sand containing trace amounts to abundant organic material ranging from leaf matter and twigs to logs.

Native soils generally underlie the topsoil although in places the topsoil is underlain by fill that was used to level the land surface or fill in marshy areas. The fill contains brick fragments, broken glass, nails, and is in some areas underlain by a distinct orange burn horizon that was produced when the land was being deforested for development. This burn horizon is present up to 5 feet below the ground surface, indicating that the top 5 feet of the ground in some areas consists of fill. The native soils consist primarily of sand and gravel, with shallow discontinuous lenses of silt and clay. The ratio of sand to gravel varies greatly with depth and laterally throughout the site, and the grain size of the sand and gravel is also highly variable. The sand is generally medium- to coarse-grained and the gravel is fine to coarse. There are frequent cobbles up to one foot in diameter and occasional boulders up to 3 feet across.

A layer of dense silt is present within the sand and gravel throughout the entire site. This is at least 4 feet thick and in places is greater than 10 feet in thickness. The top of the silt shows subsurface relief that probably results from irregular erosion by the Skykomish River; however, in general, the upper surface of the silt gently rises from an approximate elevation of 905 feet at the western part of the site to 925 feet at the eastern end. The silt is present at depths between 10 and 27 feet below the ground surface.

Previous site investigations have not reached bedrock; however, the base of the soils is estimated at an approximate depth of 200 to 250 feet according to local area well logs (GeoEngineers, 1993). Additional information on soil is provided in Section 3.2.1, which summarizes soil quality data collected as part of the site RI and Supplemental RI (RETEC, 1996 and RETEC, 2002a).

2.2.1.2 Sediment

The site includes two separate areas where sediment may be subject to cleanup activities. These are the former Maloney Creek channel and the south bank of the South Fork of the Skykomish River west of the Skykomish River

Bridge. These two areas have substantially different characteristics. The former Maloney Creek channel is discussed in more detail in the next section (Former Maloney Creek Channel/Wetlands). The Skykomish River is discussed below.

The South Fork of the Skykomish River is a high-energy river (gradient is approximately 27 feet per mile) carrying a relatively low load of suspended sediment. In general, depositional environments are few and ephemeral in the South Fork, and the riverbed is dominated by heavier glaciofluvial materials (sands, gravels, and cobbles), which are less subject to scour than the finer sand and silt typically considered “sediment.” Sand occupies many of the interstices of the larger substrate materials in the channel.

In Skykomish, the River makes a significant bend at the Fifth Street Bridge (Fig. 2-2). Along the River’s southern shoreline, adjacent to the levee and the locations of hydrocarbon seeps (Figure 2-4), finer sediment may be deposited as a result of lower river velocities, particularly during low seasonal flows. The sediment deposited in this area is typically eroded on at least a seasonal basis during higher flows and, as a result, these deposits are considered ephemeral in nature. In addition, large riprap and cobble substrates associated with the levee form a near-vertical shoreline edge along the south riverbank, approximately 1 to 2 feet in height, relative to the riverbed elevation, also indicating a non-deposited environment where hydrocarbon seeps have historically been observed.

The larger riprap and boulders present along this shoreline may reduce flow velocities near the bank by creating eddies where water flows around these larger substrates. At times, sediment accumulates in these areas. However, the sediment seldom appears to exceed a few inches in depth, except in the interstices between cobbles. This sediment grades into bank soils accumulated between cobbles in the riparian zone. The total width of this area is approximately 10 feet and represents the extent of the sediment resource in the Skykomish River.

A sediment impact zone was identified as part of the Supplemental RI (Figure 2-4). The Supplemental RI and subsequent sediment work detailed in the *Results of Supplemental Sediment Sampling – Toxicity Evaluation and Sediment Cleanup Levels* (RETEC, 2003a) identified an area of sediment concern covering approximately 440 feet along the bank, for a total area of approximately 8,117 square feet (see Appendix B). The actual extent of sediment accumulation areas affected by bank seepage is generally limited to transient accumulations in a strip less than 10 feet (generally 1 to 3 feet) wide inside the study area, for a total of 440 to 1,320 square feet.

The sediment accumulation is dominated by sand with lesser amounts of silt. The organic carbon content in the sediment appears to vary seasonally or

vertically. Samples collected higher on the bank for the Supplemental RI during summer of 2001 had an average total organic carbon (TOC) of 1.1 percent. Samples collected lower on the bank during fall of 2002 had an average TOC content generally lower than 0.3 percent. The higher TOC samples are submerged only during high flows.

Further information on sediment quality in the Skykomish River is presented in Section 3.

2.2.1.3 Former Maloney Creek Channel

The former Maloney Creek channel is present along the southern boundary of the railyard to the east of 5th Street. A Wetland Detailed Study of the former channel appears in Appendix C. This former Creek channel has been impacted by former site conditions, and may be potentially affected by the cleanup actions. The eastern boundary of this area is from the culvert under Old Cascade Highway where the drainage ditch crosses to the north side of the road adjacent to the site. Stormwater drains into ditches adjacent to the road and flows through the culvert under Old Cascade Highway to the north side of the road adjacent to the site. Flow is intermittent through these ditches. The western boundary of the former Maloney Creek channel passes through a culvert under the intersection of 5th Street and Old Cascade Highway to a point downstream of the Fire Station, where the flow emerges before reaching the current channel of Maloney Creek (Figure 2-5).

Figure 2-5 is the only figure that shows the delineated wetland as determined in the Detailed Wetland Study. The preliminary delineation that is used in all other figures is larger than that shown in Figure 2-5. As such, the estimates of volume and cost in the Former Maloney Creek Aquatic Zone are conservative.

Maloney Creek occupied the former Maloney Creek channel prior to being rerouted to its current location in approximately 1912 (USFS, 1991). Wetlands may have existed in the riparian corridor along the borders of the former creek prior to being rerouted, but the former channel and associated wetlands are now classified as a depressional outflow wetland. The former Maloney Creek channel now receives runoff from roads and residential yards via a culvert from the ditches on the south side of the Old Cascade Highway (Figure 2-5). The Wetland Detailed Study contained in Appendix C provides additional description of the wetland.

In the area between the culverts the channel widens and forms a wetland covering approximately 0.95 acres. The area is wooded, with a healthy population of alder, cottonwoods, and other native and non-native water tolerant shrubs. The BNSF facility bounds the area to the north, and residential properties and Old Cascade Highway bounds it to the south. The complete Wetland Detailed Study contained in Appendix C provides the

delineation, characterization, and functional analysis of this wetland. Water content is intermittent, fed primarily by runoff from the drainage ditches and the railyard, but probably also by groundwater recharge during times of high water tables. During times of water flow salmonid fish have been observed in the wetland as well as in the drainage ditches upstream of the wetland (Ecology 2002b).

Figure 2-5 shows the former Maloney Creek channel, with a longitudinal cross section illustrating its hydrogeologic relationship with the surrounding soil. The channel substrate consists of silt and sandy silt of varying depth, but generally extending a few feet, overlying the typical glaciofluvial deposits of the area. Groundwater levels generally are deeper than the bed of the channel by 1 foot or more.

Contaminated soils are present in the subsurface along portions of the channel, and may reach the surface locally near location 02SED-5. The biologically active top foot of the wetland is dominated by historical and current surface runoff via the stormwater collection systems described in Section 2.2.3, and probably some localized intermittent upwelling in the neighborhood of 02SED-5.

The sediment quality in the former Maloney Creek channel sediment will be discussed further in Section 3.2.4. Contamination present in the glaciofluvial deposits in the deeper subsurface is contiguous and congruent with the subsurface contamination in the railyard soil, and will be addressed separately from the surface wetland. The quality of the deeper zone is also discussed in Section 3.2.1.

2.2.1.4 Topography

The topography of the town and the surrounding area south of the river is shown on Figure 2-6. The east end of the town is generally the highest part of town, nearing 950 feet above sea level. The west end of town descends to 920 feet above sea level. The lowest portions of the town include the former Maloney Creek channel, Maloney Creek, and the Skykomish River. As seen on Figure 2-6, the railroad tracks are built up higher than the rest of the town. North of the railroad tracks, the topography is relatively flat, but gently slopes down from east to west towards the Skykomish River.

2.2.1.5 Unique Physical Features

Human activity has strongly modified three distinct areas in the town. These include residential and business areas, flood berms, and the railyard. The residential and business areas contain single-family homes, and commercial and public buildings. Areas that are not covered by buildings or roadways generally consist of grass lawns.

Fifteen-foot high levees (berms) have been installed near the Skykomish River for flood protection. These berms are composed of fill material made up of sand and gravel. Boulders armor the surface of the north side of the berms, but the percentage of boulders within the berm is unknown. The locations of the berms are shown on Figure 2-1.

The third distinct area is the railyard. Gravel up to 1 inch in diameter occupies the railyard on the majority of BNSF property (Figure 2-1).

The former Maloney Creek channel, along the southern boundary of the railroad yard, conveys stormwater draining from the railyard and street as well as runoff from residential yards south of the Old Cascade Highway. It includes a wetland that is described in detail in subsequent sections and Appendix C (see Figure 2-1). This area has a layer of silt or silty sand overlaying glaciofluvial area sediments.

2.2.2 Water

This section describes the volume of water moving through the geology and soils at the site and the town, and how the water moves. This section also introduces references to water quality; greater detail is provided in the analysis of nature and extent of contamination in Section 3. The water described in this section includes surface water, runoff and infiltration, floods, groundwater, and water supply wells.

2.2.2.1 Surface Water Movement, Quantity, and Quality

Surface waters in and nearby the town include the Skykomish River, the wetland in the former Maloney Creek channel, and Maloney Creek (Figure 2-1). These three surface water features are described below.

Additional information is provided in Section 3.2.5, which summarizes surface water quality data collected as part of the remedial investigations at the site.

Skykomish River

The Skykomish River is a fast flowing river with fluctuating flow and water levels throughout the year. It receives its water from small, upstream tributaries and spring snowmelt. The Skykomish River contains flowing water all year.

Water levels are lowest in the late summer (July, August, September, October). Table 2-1 summarizes mean river flow in cubic feet per second (cfs) and river height. River flow is gauged at the Gold Bar gauging station, located approximately 20 miles downstream of the town. River height is gauged at a USACE electronic water level gauge on the 5th Street Bridge over the Skykomish River. Gold Bar data can be accessed in real time while 5th

Street Bridge data is available on a time-delay basis. There is a correlation between the Gold Bar flow data and river depth at the 5th Street Bridge. Therefore, Gold Bar flow data can be used to calculate water depths at the Skykomish Bridge in real-time (RETEC, 2002b). Tributaries flowing into the river between Skykomish and Gold Bar cause the flow at Gold Bar to be greater than the flow at Skykomish. A heavy storm event can cause the water level to rise several feet overnight as the water flow increases.

Low-velocity areas are present in the river margin along the base of the levee throughout much of the southern shoreline. Particularly downstream of the bridge, large riprap and cobble substrates form a vertical shoreline edge along the south riverbank which is approximately 1 to 2 feet in height, relative to the riverbed elevation. The larger riprap and boulders present along this shoreline reduce flow velocities near the bank by creating eddies where water flows around these larger substrates. Low-flow areas are also present within the interstices of the larger boulders and riprap. The base of this shoreline edge is at approximately 4.5 to 5 feet gauge height. During flows above this height, water adjacent to the shoreline edge is approximately 1 to 2 feet deep. Below this height, the river recedes from the base in most areas.

Substrates within the Skykomish River are dominated by cobbles, and vary in size from large boulders and large cobbles, to smaller gravels and sands. Larger boulder substrates are more frequent along the northern portions of the channel, with smaller cobbles, gravels, and sands occurring along the southern shore. Larger cobbles, boulders, and riprap associated with the base of the flood control levee are also present along the southern shoreline. Gravels and sands occupy many of the interstices of larger substrates within the river channel.

The Former Maloney Creek Channel

In about 1912, Maloney Creek was diverted to a new channel (USFS, 1991). This channel developed wetland characteristics fed primarily from stormwater runoff from surrounding areas. Subsequent infill has eliminated part of the southern portion of the channel, but the greater part remains a wetland with intermittent water flow. This is the former Maloney Creek wetland (Figure 2-5).

The topography of the land adjacent to the former Maloney Creek channel indicates that historically, discharges and runoff from the southern portion of the railyard as well as from the residential areas to the south probably flowed through the former Maloney Creek channel. Although no hydrologic studies are available for confirmation, it is likely that most of the intermittent flow during low water table conditions in the channel, and a significant portion of the water flowing through the channel during high water table conditions, is derived from surface runoff and drainage (see Appendix C). Sediment cores

and samples were collected and analyzed as part of the Supplemental RI (RETEC, 2002a).

The former Maloney Creek channel can be described as three distinct segments, as described below:

- **The Upstream Segment.** This segment is south of the Old Cascade Highway. It is approximately 4 to 5 feet wide and is confined within a series of drainage ditches. Culverts convey flow beneath numerous roads and driveways along the south side of the highway. The substrate in this area is dominated by gravels and sands, with occasional small cobbles present.
- **Middle Section.** This segment is south of the railyard and north of the Old Cascade Highway and includes the wetlands described in App. P. Second-growth deciduous trees dominate this segment. The wetland, with its associated channel, is approximately 60 to 80 feet wide. The channel within the wetland is undefined throughout most of its length, with surface layers dominated by sands and silts overlain with varying amounts of organic debris. Small patches of gravel are also present in places. At lower flows, ponding occurs throughout this area.
- **The Downstream Segment.** This segment is downstream of the Old Cascade Highway culvert south of the firehouse. This segment is dominated by small cobbles and gravels, with areas of sand deposition. The channel is approximately 3 to 5 feet wide. The entrance to the culvert beneath the firehouse is approximately 400 feet upstream of the confluence, and the culvert itself is approximately 220 feet long.

The plant and animal species that live in these three areas will be discussed in Sections 2.2.4 and 2.2.5. The geology of this area is discussed in Section 2.2.1.

Maloney Creek (current channel)

Maloney Creek receives runoff from its catchment area, which includes the former Maloney Creek channel. Its catchment area is estimated to be approximately 1,914 acres and is shown on Figure 2-7. Maloney Creek drains into the South Fork of the Skykomish River to the west of the city. Maloney Creek contains flowing water all year; however, no gauging data is available. It demonstrates a pattern similar to that of the Skykomish River. Maloney Creek is also considered shoreline under the Shoreline Management Act of 1971 (Chapter 90.58 RCW).

2.2.2.2 Stormwater Runoff and Infiltration

There are three catchments that capture and pipe stormwater in the Town of Skykomish: the town catchment, the former Maloney Creek catchment, and the railyard catchment. The town catchment captures stormwater runoff north of the railroad tracks; the former Maloney Creek catchment, south of the railroad tracks; and the railyard catchment, from the south side of the railroad tracks. These three catchments are described below and illustrated on Figure 2-8.

Surface water infiltrates in unpaved areas on the north side of the railroad tracks.

Town Catchment

North of the railroad tracks, stormwater accumulates in one of four collection basins that flows by way of one of three culverts through the berms to the west of the Skykomish River Bridge and directly into the Skykomish River. The locations of these features are shown on Figure 2-8. In unpaved areas on the north side of the railroad tracks, stormwater does not accumulate in these collection basins but infiltrates through surface soil.

There is no municipal storm sewer system in Skykomish.

Former Maloney Creek Catchment

The catchment area for the former Maloney Creek channel is approximately 42 acres, as shown on Figure 2-7. It is bounded by 5th Street to the west, the railroad tracks to the north, and extends no further than the residential areas to the east and south.

Stormwater runoff passes along ditches and through culverts in the former Maloney Creek catchment area. Figure 2-8 illustrates the locations of the culverts. Twenty-four-inch culverts generally pass in the east/west direction under streets and driveways along the Old Cascade Highway. The easternmost culvert passes under 4th Street and passes under each street and driveway to the west until it passes under the Old Cascade Highway in the northwest direction, connecting the flow to the former Maloney Creek channel. Water then flows through the channel to the west, receiving runoff from the railyard (discussed below).

Flow from the former Maloney Creek channel then passes through a 36-inch culvert under the fire station to the southwest. After the culvert, the stream runs approximately 400 feet until it joins the current Maloney Creek channel, leading to the South Fork of the Skykomish River.

Railyard Catchment

The former Maloney Creek channel receives runoff from the railyard. Stormwater on the southern side of the railyard flows to the west along the tracks to a depression just east of 5th Street. This depression or catch basin (cb) may be seen on Figure 2-8. At this depression, one culvert passes from this depression to the south where it discharges into the former Maloney Creek channel. Another culvert historically transferred stormwater from this depression to the north under the tracks, but has since been blocked by a telephone pole, which stops flow through this culvert.

2.2.2.3 Floods

The 100-year and 500-year flood map is provided as Figure 2-9. A flood protection levee is located along the southern side of the Skykomish River to the west of the Skykomish River Bridge (Figure 2-1).

The 100-year flood is anticipated to flood all of the areas to the west of 5th Street and north of the railroad tracks, with the exception of the railroad tracks; the railroad tracks are elevated above the rest of the town, preventing much flooding in a 100-year flood on and to the south of the railroad tracks. The area north of East River Road and portions of the block between Railroad Avenue and East River Road will likely also be inundated in a 100-year flood. However, flooding would follow the Maloney Creek drainage corridor and flood the areas south of the creek.

A 500-year flood would cover the entire town north of the railroad tracks, but the entire portion south of Old Cascade Highway would be safe from flooding.

2.2.2.4 Groundwater Movement, Quantity, and Quality

To demonstrate the movement of groundwater, one must understand the types of soil that exist at a site because groundwater exists in the ground in spaces between soil particles. Water moves easiest through soil with larger grain sizes because these soils cause larger spaces between them. Water has a more-difficult time moving through soils with smaller grain sizes because they can become compacted causing less space between them. Soils with larger grain sizes at the site are gravel and sand; whereas, soils with smaller grain sizes include clayey silt. As such, the movement of groundwater based on the geology of the site will be analyzed in this section.

Regionally, the site is located within the Skykomish Valley, a relatively steep-sided, rock-walled valley that has been partially filled with glaciofluvial sediments. These glaciofluvial sediments consist mainly of sand and gravel. The direction of regional groundwater flow along the Skykomish Valley is westerly, in a downslope direction coincident with the slope of the floor of the valley.

Shallow groundwater is present in the sand and gravel aquifer underlying the site. The aquifer materials vary greatly in the size and proportion of the sand and gravel; however, in general, little silt or clay is dispersed throughout. The concentration of total organic carbon in the sand and gravel generally ranges between approximately 0.1 and 0.5 percent. Where silts and clays are present, they typically occur as thin discontinuous lenses that will not affect the overall horizontal groundwater flow rate or direction throughout the aquifer; however, they may serve as aquitards to vertical groundwater flow, as described below.

Depth to Groundwater

The depth to groundwater ranges approximately from 3 to 17 feet below ground surface throughout most of the site. In low-lying areas immediately adjacent to the Skykomish River, drainage ditches, and the former channel of Maloney Creek the groundwater may intersect the ground surface and therefore the depth to groundwater in those limited areas may be zero feet below the ground surface. It is generally shallowest close to the Skykomish River and increases in depth to the south. The shallow groundwater is hydraulically connected with surface water in the Skykomish River and former Maloney Creek channel. The bank is composed of sand and gravel, and is similar to the sand and gravel underlying the site, except that the bank is armored in places with coarse riprap. Groundwater flow out of the bank is unlikely to be reduced or enhanced by the riprap.

The groundwater levels throughout the site are influenced by the river level, precipitation, temperature, and local drainage. These factors cause the groundwater levels to vary seasonally. Figure 2-10 shows hydrographs with monthly groundwater levels during 2002 and 2003 in 1A-W-3 and 2A-W-1. These hydrographs show that the measured groundwater levels have varied by 4 to 7 feet since January 2002. They were high during winter and spring and low during summer and fall. Precipitation patterns affect the exact duration and periods of the high and low water levels, as well as the magnitude of the groundwater level changes.

Groundwater elevations are the highest at the southeast corner of the Former Maintenance and Fueling Facility and decrease to the northwest towards the Skykomish River. Groundwater elevations are generally higher during late fall, winter, and spring (November to April) and lower in the summer and early fall (June to early November) (RETEC, 2001).

A 600-foot long subsurface barrier wall was installed in 2001 to intercept the migration of free product towards the river. This barrier wall was designed so that the groundwater levels would not increase by more than 5 inches behind the wall. Monthly fluid levels have been collected from selected wells behind the wall; these levels indicate that groundwater does not appear to be

mounding behind the wall, and that groundwater passes under the wall without hindrance.

The former Maloney Creek channel is an intermittent wetland fed primarily by runoff but also occasionally by groundwater influx. The water table is located well below the bed of the channel during seasonal low groundwater levels. During measured seasonal high water levels the groundwater rises to a foot or less below the channel, and it is likely that at times groundwater surfaces in the former creek bed and feeds the channel. The former Maloney Creek channel is discussed further in the surface water section (above) and in Section 2.2.4.

Hydraulic Conductivity

Hydraulic conductivity values, a measure of the permeability of the sand and gravel, have been calculated using laboratory and field tests; these tests have provided hydraulic conductivities between 41 and 84 feet per day (RETEC, 1996). These values are representative of sand and gravels (Todd, 1980).

A clayey silt bed, which is 4 to more than 10 feet thick, underlies the entire site. The top of this silt is present at depths between 10 and 27 feet below the ground surface. The hydraulic conductivity of this unit has not been tested. However, the hydraulic conductivity of a similar clayey silt was measured to be 0.4 feet per day in the RI (RETEC, 1996); this is a representative value for silt (Todd, 1980). Because of the significantly lower hydraulic conductivity, this silt bed impedes vertical groundwater flow within the sand and gravel aquifer and acts as an aquitard.

Groundwater Flow Direction and Gradient

The groundwater flow in the shallow, unconfined sand and gravel aquifer varies throughout the site; however, most groundwater flow throughout the site is horizontal. There is no evidence that preferential channels are present within the site that may affect groundwater flow direction, although silt and clay lenses within the gravelly sand unit can potentially change groundwater flow direction due to the difference in hydraulic conductivity between the silt and the sand and gravel. Groundwater usually has some vertical component to flow; however, the vertical flow is restricted by the silt aquitard.

Groundwater levels collected during several gauging events indicate that the overall flow directions within the site are relatively consistent with time. Figure 2-11 presents a groundwater surface elevation map that was prepared using groundwater levels collected during January and February 2002. East of 4th Street, the groundwater generally flows from south to north, towards the Skykomish River with an average gradient of 0.14 feet per foot (that is 0.14 vertical feet per one horizontal foot). To the west of 4th Street, the groundwater flows from the southeast to the northwest with an average

gradient of 0.01 feet per foot (RETEC, 2002a). The hydraulic gradient indicates that groundwater flows at an average rate of 2.5 feet per day (ft/day) (RETEC, 2002a). Groundwater contour maps and additional details on groundwater flow are contained in the Supplemental RI (RETEC, 2002a).

Vertical gradients within the site have been measured using several pairs of wells co-located, but screened at different depths (RETEC, 1996). The measurements show that the gradients are low and do not indicate a strong vertical flow component. The downward vertical gradients are greatest during periods of high groundwater (heavy rainfall) and the lowest gradients have occurred during periods of low rainfall, when groundwater levels are low. This downward gradient is due to rainfall infiltration recharging the groundwater and the effect of the aquitard impeding flow from the overlying sand and gravel to the underlying sand and gravel.

Groundwater Quality

Additional information is provided in Section 3.2.3, which summarizes groundwater quality data collected as part of the Supplemental RI (RETEC, 2002a).

2.2.2.5 Water Supply

No water supply wells are located in the Town of Skykomish. The people of Skykomish are served by two public water supply wells that are located about 1,100 feet east (upgradient) of Skykomish. The primary well is completed to a depth of 216 feet below ground surface (bgs) and is screened across three intervals between 181 and 216 feet bgs. A backup well is located adjacent to the primary well and is completed to a depth of 219 feet bgs. In 1993, the water system pumped an average of 70,000 gallons per day and 2,100,000 gallons per month. Storage capacity was provided by one water tank with a capacity of 220,000 gallons.

2.2.3 Air

2.2.3.1 Climate

The climate of the project region is predominately maritime with cool and relatively dry summers and mild, wet, and cloudy winters. Total annual precipitation is approximately 110 inches per year with an annual average snowfall of 55 inches. Mean average temperature in Skykomish is 49.3 °F. Daily mean high and low temperatures for January are 49.3 °F and 35.8 °F, respectively. Daily mean high and low temperatures for August are 79.6 °F and 68.7 °F, respectively (National Climatic Data Center, Washington State Narrative Summary, 2003).

The influence of semi-permanent high- and low-pressure areas over the North Pacific Ocean dominates winds in the area. Air circulates in a clockwise direction around the semi-permanent high-pressure cell and in a counter-clockwise direction around the semi-permanent low-pressure cell. During the summer, the low-pressure cell becomes weak and moves north of the Aleutian Islands and the high-pressure cell brings a prevailing westerly and northwesterly flow of comparatively dry, cool, and stable air into the Pacific Northwest. Winds in the area are predominately southwesterly to westerly during most of the year. Northeasterly to easterly winds dominate from November to February. Annual average wind speeds are 5.6 knots with peaks of up to 32 knots in the winter months.

2.2.3.2 Air Quality

Air quality is generally assessed in terms of whether concentrations of air pollutants are higher or lower than ambient air quality standards set at levels protective of human health. Based on an ambient monitoring data collected from a network of monitoring stations throughout the region, areas are designated as being in “attainment” or “nonattainment” for particular pollutants.

Skykomish is currently in attainment of ambient air quality standards for all criteria pollutants. This status indicates that the region meets the National Ambient Air Quality Standards (NAAQS) for all pollutants. However, the site is located on the boundary of an area that was designated as nonattainment for ozone until 1996. This area, which incorporates all but the extreme northwest portion of King County, is currently subject to a maintenance plan for ozone approved by the United States Environmental Protection Agency (EPA). The maintenance plan for ozone addresses fuel specifications for mobile sources, inspection and maintenance programs for automobiles, and industry-specific rules. The only significant sources of ozone precursors in the Skykomish area are automobile and train traffic. This project will not be directly affected by the current ozone maintenance plan. The Puget Sound Clean Air Agency (PSCAA) is currently in the process of updating the maintenance plan for the region.

No stationary industrial sources of air pollution have been identified in the proximity of the site. Automobiles travel in the town and on the busier Northeast Stevens Pass Highway (U.S. 2) at the north end of town. Approximately 24 trains pass through Skykomish on a daily basis (Yates, 2003a) and are responsible for diesel exhaust emissions, but they do not routinely stop and idle in town.

Additional information is contained in Section 3.2.6, which summarizes air quality data collected as part of the RI, Supplemental RI and other investigations.

2.2.3.3 Odor

No industrial odor sources are present in Skykomish. Emissions resulting from diesel exhaust from daily trains passing through Skykomish may be a source of odors. Seepages of hydrocarbons have been noted at a number of locations along the Skykomish riverbank. These seepages are the source of hydrocarbon odors along the levee, particularly during low flow conditions and calm winds.

2.2.4 Plants

This section describes the plant life in the Town of Skykomish and at the site. It includes information on the habitats of plants, special plant status, and noxious weeds.

2.2.4.1 Plant Habitat Diversity

The site is located in the western hemlock (*Tsuga heterophylla*) vegetation zone, the most widespread vegetation zone in western Washington (Franklin and Dyrness, 1973). The mild climate of this zone supports growth of productive coniferous forests dominated by Douglas fir (*Pseudotsuga menziesii*), western hemlock, and western red cedar (*Thuja plicata*). Common understory plants include swordfern (*Polystichum munitum*), salal (*Gaultheria shallon*), red osier dogwood (*cornus sericea*) and huckleberry (*Vaccinium spp.*).

The majority of the site is within the developed portions of the Town of Skykomish, consisting of BNSF railyards, and residential and commercial properties. Two small parcels of undeveloped, forested land are adjacent to the site, north of Maloney Creek and at the Maloney Creek outlet. Figure 2-12 shows the habitat types present in the site vicinity. The botanical resources of each of the mapped habitat areas at the site are described below.

Railyard

The railroad yard is an open habitat mostly covered in gravel and sparsely vegetated with grasses and weedy forbs. The area is subjected to high levels of soil and vegetation disturbance, including heavy railroad traffic. It provides low quality habitat for plants.

Residential and Commercial

Habitat in these areas includes buildings, paved roads and sidewalks, paved and graveled driveways, turf grass lawns, home gardens, and a variety of trees and shrubs. Small shrub thickets and young to mature second-growth trees are scattered throughout the area. Weedy non-native species are present along disturbed roadsides.

Skykomish River Flood Control Levee and Shoreline

The south bank of the South Fork of the Skykomish River, which borders the Town of Skykomish, is developed and disturbed to the water's edge along most of its length. Young and mid-successional-aged deciduous trees and scattered patches of shrubs are present along portions of the shoreline. Riparian habitat is poorly developed along the shoreline, as shown on Figure 2-12.

The riprap flood control levee occupies less than 1 acre along the south side of the river (Figure 2-1). Adequate soil is present to support understory vegetation and low density of trees and shrubs along the top and sides of the levee. The northern side of the levee, extending to the ordinary high water line of the river, is dominated by young big-leaf maple (*Acer macrophyllum*) and red alder averaging about 5 inches diameter at breast height (dbh).

Swordfern, Himalayan blackberry (*Rubus discolor*), and giant knotweed (*Polygonum sachalinense*) are present in the understory. The top and southern side of the levee are dominated by grasses and shrubs with a few scattered small trees. Grand fir (*Abies grandis*), black hawthorn (*Crataegus douglasii*), tall Oregon grape (*Mahonia aquifolia*), and snowberry (*Symphoricarpos albus*) are present. Orchardgrass (*Dactylis glomerata*), English plantain (*Plantago lanceolata*), common tansy (*Tanacetum vulgare*), and mullein (*Verbascum thapsis*) are among the common non-native species present at the levee.

Upstream and downstream of the levee, the bank of the Skykomish River is occupied by residences with associated lawns and outbuildings. A few scattered trees and shrubs are present along the riverbank.

Former Maloney Creek Channel

The former Maloney Creek channel is dominated by early to mid-seral deciduous trees and shrubs, with the exception of the culvert inlet site, which is dominated by herbaceous species (see Appendix C). Black cottonwood, red alder and big-leaf maple are the dominant tree species. Red-osier dogwood (*Cornus sericea*) and salmonberry are the dominant shrub species. Native herbaceous species present in the wetland include large-leaf avens (*Geum macrophyllum*), small-fruited bulrush (*Scirpus microcarpus*), piggy-back plant, and common horsetail (*Equisetum arvense*). Non-native species observed at the site include giant knotweed, Himalayan blackberry, and Scot's broom (*Cytisus scoparius*).

The boundaries of the wetland area of the former Maloney Creek Channel are generally discernable, as it is bounded by the railyard area to the north and the Old Cascade Highway and residential development to the south, which have

distinct slope breaks. The formal delineation and functional assessment is contained in Appendix C.

The following describes the plant species in the three segments of the former Maloney Creek channel introduced in Section 2.2.2.

- **Upstream Segment.** At the upstream end, the former Maloney Creek channel is confined to a narrow ditch vegetated with grasses, swordfern, salmonberry, and weedy forbs (Figures 2-13 and 2-14). Overstory trees are scattered along the south side of the ditch and include red alder, big-leaf maple, and a few young western red cedar (Figure 2-15). This reach functions as a roadside stormwater drainage ditch.
- **Middle Segment.** The middle section of the historic channel passes through a wetland (see Section 2.2.2, Surface Water Movement, Quantity and Quality). The wetland habitat is dominated by second-growth deciduous trees including red alder, big-leaf maple, and black cottonwood. The understory is dense in places and consists primarily of salmonberry, willow, and weedy species such as giant knotweed and Himalayan blackberry.
- **Downstream Segment.** At the downstream end, the channel is well-defined for a distance of about 400 feet, between the Old Cascade Highway culvert and the confluence with Maloney Creek. Vegetation along the lower section of the historic creek channel is disturbed second growth forest of big-leaf maple and red alder. The sparse understory is composed of salmonberry, vine maple, and sword fern. Residential yards and storage areas impinge in this area.

2.2.4.2 Special Status Plant Species and Habitats

All of the habitats at the site have been disturbed by human activity, such as industrial, residential or commercial development and timber harvest. Native, forested habitat is limited to a small second growth area along the former Maloney Creek channel. This area is disturbed, with a high number of non-native understory species. The site habitats provide low potential for rare plant species, based on the level of current and historical disturbance. No populations of rare, threatened or endangered plant species are known or expected to occur on the site and none have been observed or reported.

The following list the results of research on the special status plant species and habitats for the site:

- A search of the Washington State Department of Natural Resources Natural Heritage Program Database was requested for the site and surrounding areas. No data records for rare plants or high quality ecosystems are present in the database (WDNR, 2002).
- The Washington Department of Fish and Wildlife (WDFW) Priority Species and Habitats database was queried for the presence of priority habitats in the vicinity of the site. Priority habitats are those habitat types or elements with unique or significant value to a diverse assemblage of species. No priority habitats were noted in the database (WDFW, 2003a). Riparian areas along the South Fork of the Skykomish River and Maloney Creek would qualify as priority habitats under the state guidelines. Wetland habitats, such as the wetland within the former Maloney Creek Channel, would also be classified as a state priority habitat.
- The United States Fish and Wildlife Service (USFWS) noted that white-top aster (*Aster curtus*), a federal plant species of concern, has been reported from King County (USFWS, 2003). This species is restricted to grassland habitats in the Puget lowlands; suitable habitat for the species does not occur in the Skykomish area.
- The Town of Skykomish Critical Area Ordinance (CAO) lists the Skykomish River and Maloney Creek shorelines as Primary Fish and Wildlife Habitats. For purposes of this evaluation, the former Maloney Creek channel and associated wetland are ranked as secondary fish and wildlife habitats, based on the lack of documented presence of species listed by the federal government or state of Washington as endangered, threatened, or sensitive (see Section 2.2.6, Fish and Aquatic Resources).

2.2.4.3 Noxious Weeds

Weed control activities on private and state lands in the Skykomish area are managed through the King County Noxious Weed Control Board. Management goals for noxious weeds vary based on weed class: eradication of Class A weeds is required by state law; Class B designated weeds must be prevented from producing seed; and Class B non-designates and Class C weeds may be designated for control at the option of the local weed control board. On National Forest System lands near Skykomish, the United States Forest Service (USFS) administers weed management programs.

No Washington State Class A weeds are known or suspected to occur in the site vicinity. Six species of Class B designate weeds are known to occur in and near the Town of Skykomish (King County 2003a and 2003b):

- Orange hawkweed (*Hieracium aurantiacum*)
- Diffuse knapweed (*Centaurea diffusa*)
- Spotted knapweed (*Centaurea biebersteinii*)
- Dalmatian toadflax (*Linaria dalmatica* ssp. *dalmatica*)
- Sulfur cinquefoil (*Potentilla recta*)
- Policeman's helmet (*Impatiens glandulifera*)

One species of Class C weed, yellow toadflax (*Linaria vulgaris*), has been recorded in the area.

Orange hawkweed is common along roadsides throughout the Town of Skykomish and in the railyard area. Policeman's helmet is found in moist areas in the southwest side of town between Helen and Thelma Streets. BNSF currently implements management activities for orange hawkweed, diffuse knapweed, spotted knapweed, dalmatian toadflax, yellow toadflax, and sulfur cinquefoil along the rail line in the vicinity of Skykomish.

The USFS weed management program targets three weed species in the Town of Skykomish (USFS, 1999). Japanese knotweed and giant knotweed are present along the Skykomish River corridor and Maloney Creek corridor, and are prescribed for control efforts on National Forest System lands. Scot's broom is present on National Forest System lands along a transmission line corridor that passes through Skykomish. These species are listed as noxious weeds of concern by King County; control of these species is recommended (King County, 2003a).

2.2.5 Wildlife

This section describes the animal life in the Town of Skykomish and at the site. It includes information on the habitats of animals, special status species, and threatened and endangered species.

2.2.5.1 Wildlife Habitat Diversity

Wildlife habitats at the site are affected by ground disturbance, high human activity levels, and urban conditions, and are suitable primarily for wildlife species that are tolerant of these conditions. The wildlife on each of the mapped habitat areas at the site is described below (as illustrated on Figure 2-12).

Railyard

The railyard area receives high levels of human, vehicle, and train activity, and provides low value to wildlife. The grass and weed-dominated site is used primarily by birds and small mammals. Generalist species of disturbed habitats, such as coyote and raccoon, may also use the railyard area on occasion.

Residential and Commercial

Residential back yards in the Town of Skykomish support wildlife habitat for birds and small mammals that use inhabited sites and are tolerant of human activity. Bird species that are expected to be present in the area include, but are not limited to, American robin, house sparrow, Stellar's jay, and starling.

Skykomish River Flood Control Levee and Shoreline

The riparian zone along the south bank of the Skykomish River is of low quality due to the extent of development close to the shoreline. Animals that may use the shoreline habitat include, but are not limited to, common crow, coyote, raccoon, and mink.

Former Maloney Creek Channel and Wetland

The patches of forested and wetland habitat along the former Maloney Creek channel are expected to be used by various birds and mammals, including, but not limited to, towhee, dark-eyed junco, common bushtit, common crow, coyote, and raccoon.

2.2.5.2 Special Status Wildlife

The WDFW, USFS, and USFWS were contacted to determine the presence of special status wildlife species in the vicinity of the Site (Township 26 North, Range 11 East, Sections 26, 27, 33, 34, and 35), the results of the data requests are summarized below:

- **Cascades Frog.** The Cascades frog is a federal species of concern and a state monitor species. In Washington, the Cascades frog occurs at mid-to high elevations in the Cascades and the Olympic mountains (Leonard *et al.*, 1993). It is rarely found below elevations of 2,000 feet. The species is most commonly found in small pools in sub-alpine meadows and also inhabits sphagnum bogs, forested swamps, small lakes, ponds, and marshes near streams

No suitable habitat for Cascades frog is expected to occur in or near the Town of Skykomish at an elevation of 950 feet. No occurrences of Cascades frog were documented in state or federal databases (USFWS, 2003; WDFW, 2003a).

- **Northern Red-Legged Frog.** The northern red-legged frog is a federal species of concern that occurs at low to moderately high elevations in western Washington. It typically uses small ponds, pools, and swamps within forest stands (Leonard et al., 1993). During the breeding season, the species is most abundant in ponds and pools that are seasonally, rather than permanently, flooded. Red-legged frogs breed in winter, attaching the egg masses weakly to emergent vegetation or underwater branches. Newly metamorphosed frogs, as well as mature adults, are more terrestrial than aquatic, inhabiting shrub and forested areas near permanent water.

Red-legged frogs were not detected during wetland surveys of the former Maloney Creek Channel in July 2003. This species may occur in the vicinity of the site.

- **Oregon Spotted Frog.** Oregon spotted frog is a candidate for federal listing and a Washington State endangered species. Historically, Oregon spotted frog was present in the Puget trough lowlands from southern British Columbia to northern California and east into the Cascade Mountains in southern Washington and Oregon (Leonard et al., 1993). Habitat loss, through modification of riparian and wetland habitat, is thought to be a major factor in the population decline. Currently, three populations of Oregon spotted frog are known in Washington State: one in the south Puget Sound, and two in the Cascade Mountains of south-Central Washington (McAllister and Leonard, 1997). One population is known from British Columbia and another 20 populations are documented in Oregon.

Suitable habitat for Oregon spotted frogs is shallow, emergent wetlands, typically in forested settings (Leonard et al., 1993). Oregon spotted frogs rarely leave the aquatic environment and are usually found in standing, shallow water with abundant emergent or floating vegetation. No suitable habitat for Oregon spotted frog occurs at the project site or vicinity of the Town of Skykomish. No observations of Oregon spotted frog have been reported in the vicinity of Skykomish (USFWS, 2003; WDFW, 2003a).

- **Tailed Frog.** The tailed frog is a federal species of concern and a state monitor species that occurs in cold, rocky streams from British Columbia to northern California (Leonard et al., 1993). Tailed frogs inhabit cold, rocky streams from low to high elevation, spending several years as tadpoles. Adults are nocturnal and infrequently seen, emerging at night to feed on insects near the

stream and in the adjacent forest. Adults can be found in summer, and tadpoles year-round, by turning over rocks in the stream. Tailed frogs do not inhabit ponds or wetlands.

Suitable habitat for tailed frog is not present at the site. The higher gradient reaches of Maloney Creek to the south of the site may support tailed frog. The population status is unknown.

- **Harlequin Duck.** The harlequin duck is a federal species of concern that has been documented to breed upstream of Skykomish along the Beckler River and downstream near the Miller River confluence (WDFW, 2003a). No records of breeding harlequin ducks have been reported along the section of the Skykomish River that borders the Town of Skykomish, or along Maloney Creek. Suitable breeding habitat occurs along fast-flowing streams and rivers with a well-developed, forested riparian zone. The site does not provide this type of habitat. Harlequin ducks may forage and loaf along the section of the Skykomish River that borders the Town of Skykomish.
- **Northern Goshawk.** The northern goshawk is a federal species of concern and a state candidate for listing. Northern goshawk has been documented within 1 mile of the site (USFWS, 2003; USFS, 2003); however, nesting status is unknown (USFS, 2003). Goshawks inhabit mature- to old-growth coniferous and mixed forests, and open woodlands. No mature or old-growth forests are present within the Habitat Assessment Area. Goshawks may occasionally pass through or forage in the Town of Skykomish.
- **Peregrine falcon.** Formerly classified as federally endangered, the American peregrine falcon was delisted in August 1999. The Washington State Status Report for the Peregrine Falcon (Hayes and Buchanan, 2002) notes the falcon is still listed as state endangered, but will likely be reclassified as sensitive in the future. No peregrine falcon nest sites are known to exist in the vicinity of the Town of Skykomish (USFS, 2003; USFWS, 2003; WDFW, 2003a).
- **Pileated woodpecker.** Pileated woodpecker is a Washington State candidate species and a USFS management indicator species. These woodpeckers are closely associated with mature and old-growth forests, using large diameter snags for nesting and roosting. Late- and old-successional forests on the Mount Baker-Snoqualmie National forests provide high-quality habitat for pileated woodpecker. Because of the extent of timber harvest activity near

the Town of Skykomish, and the lack of mature forested habitats at the site, use of the site by pileated woodpeckers is expected to be low. Occasional foraging may occur in snag in and around the Town of Skykomish.

- **Pacific Townsend's big-eared bat.** The Pacific subspecies of Townsend's big-eared bat is a federal species of concern, a USFS sensitive species, and a Washington State candidate for listing. The species is an insectivore that inhabits forested regions primarily west of the Cascade Mountains. Townsend's big-eared bats are primarily cavity-dwellers, typically selecting roost sites in caves or abandoned mines; they also use human-made structures such as barns, attics, and bridges, as long as human disturbance is very low (Pierson and Rainey, 1998). They require different sites with specific microclimatic conditions for roosting, hibernation, and reproduction. Caves have reportedly been used as maternal roost sites and hibernacula; bridges have also been documented as maternal sites (Fellers and Pierson, 2002).

The status of Pacific Townsend's big-eared bat in the Skykomish vicinity is unknown; no occurrences have been reported (USFWS, 2003; WDFW, 2003a).

2.2.5.3 Threatened and Endangered Wildlife Species

The USFWS, USFS, and the WDFW provided information on federally listed, proposed, and candidate wildlife species and Washington State threatened and endangered species that may occur in the vicinity of the site. Three listed species of birds are known to occur in the general vicinity of the site. These species, bald eagle, marbled murrelet, and northern spotted owl, are discussed below. Three listed mammal species, Canada lynx, gray wolf, and grizzly bear, could potentially occur in the site vicinity; however, no suitable habitat for these three mammals is present in the site vicinity and no sightings of the species have been documented (USFS, 2003). These species are not expected to occur in the site vicinity (USFS, 2003; Stinson, 2001) and are not discussed further in this document. A summary of threatened and endangered species is given in Table 2-2.

- **Bald Eagle.** The bald eagle is a federal and state threatened species. Recovery efforts for the bald eagle have been successful in the lower 48 states, including the Pacific region. In 1999, the bald eagle was proposed for removal from the list of threatened and endangered species, as recovery goals had generally been met or exceeded (64 FR36543).

The Skykomish River basin is used by bald eagles primarily during the winter months when spawning salmon are available as a food resource. A winter concentration area is located approximately two miles west of the Town of Skykomish along a tributary to the Skykomish River (USFWS, 2003). Another area of regular winter use by foraging bald eagles is located about a mile northeast of the Site along a tributary river (USFS, 2003).

Bald eagles may roost communally near feeding areas during the winter months. Roost sites are often located in mature or old-growth forest stands in close proximity to feeding areas. A communal night roost is located about one mile west of the Town of Skykomish (USFWS, 2003; WDFW, 2003a).

Bald eagles occasionally use of the South Fork Skykomish River in the vicinity of the Town of Skykomish (USFS, 2003). However, few suitable perch trees are present along this reach of the river, and use of the shoreline is limited. The majority of trees along the riverbank and the flood control levee are red alder and big-leaf maple of about 5 inches in diameter (maximum). These trees are not of suitable diameter and height to support bald eagles or to provide good visibility of the river.

There are no bald eagle nest sites within the Site vicinity (WDFW, 2003a; USFS, 2003).

- **Marbled Murrelet.** The marbled murrelet is a federal and state threatened seabird that nests in old-growth coniferous forests. Suitable habitat for marbled murrelet is present in the Skykomish River basin, primarily within unlogged stands of Douglas fir and western hemlock. In the Project vicinity, critical habitat for marbled murrelet has been designated within Late Successional Reserves (LSRs) designated under the Northwest Forest Plan (USFWS and USDI, 1994 as amended) for the management of northern spotted owl and other old-growth species including marbled murrelets. The LSRs occur exclusively on National Forest System lands.

No records of marbled murrelet detections were present in the WDFW or Forest Service databases. Few, if any, surveys have been conducted in the Skykomish vicinity (USFS, 2003; WDFW, 2003a). Suitable murrelet habitat is not present within one-half mile of the Town of Skykomish (USFS, 2003).

- **Northern Spotted Owl.** The northern spotted owl was federally listed as threatened in Washington, Oregon, and California in July

1990 (55 FR 26114); it is a Washington State endangered species. Factors that contributed to the federal listing were the declining population trends, the loss of suitable forested habitats throughout the species range, and the lack of adequate regulatory mechanisms to protect existing habitat for the species.

Competition with barred owls may be a factor in the population decline of spotted owls; barred owls have become common in some parts of the Washington Cascades and may outcompete spotted owls for nest-sites and prey in areas where mature and old-growth forests have been fragmented by timber harvest (Dark *et al.*, 1998, Herter and Hickes, 2000). Fragmented forest stands with openings in the forest canopy, such as result from clear-cutting and thinning, promote use by great horned owls, a major predator of spotted owls (Johnson, 1993).

Spotted owls are strongly associated with mature and old-growth forests for nesting, foraging, and roosting. Nesting and roosting occur in coniferous forests characterized by moderate to high levels of canopy closure, high density of standing snags, large diameter overstory trees with deformities such as broken tops and witches' brooms, and abundant coarse woody debris on the forest floor (USDI Fish and Wildlife Service, 1987). Foraging occurs in nesting and roosting habitat, and in coniferous forest of younger age and less structural diversity, where key prey species are present. Important forage species of spotted owls in mesic Douglas-fir forests include northern flying squirrel and woodrat species; these species occur at relatively low density and the spotted owl has a correspondingly large home range (USDI Fish and Wildlife Service, 1992).

Critical habitat was designated for the northern spotted owl in 1992 (57 FR 1796). In the project site vicinity, spotted owl critical habitat coincides with Forest Service Late Successional Reserves, all of which are located on National Forest System lands.

The WDFW database shows three spotted owl activity centers representing established territories in the vicinity of the Town of Skykomish (WDFW, 2003a). The site centers of all three territories are over two miles from the edge of town; none of the sites have been surveyed in recent years and the status of the sites is unknown (USFS, 2003). Suitable habitat for spotted owl does not occur closer than one-half mile from the edge of town (USFS, 2003).

It is possible that spotted owls, if present in the basin, could use forested habitats to the north of the South Fork Skykomish River or to the south of Maloney Creek. No habitats within the site are suitable for use by spotted owl.

2.2.6 Fish and Aquatic Biota

This section describes the fish and aquatic life in the water bodies in Skykomish. It includes information on the habitat diversity and threatened and endangered species of fish and aquatic biota.

2.2.6.1 Habitat Diversity

The obvious habitats for fish and aquatic biota at the site are the Skykomish River and the former Maloney Creek channel, which are described below. It should be noted that aquatic habitat and fish populations in the Snohomish Basin (including the South Fork of the Skykomish River) may be limited by natural low-flow conditions. These conditions typically occur in the summer months.

South Fork of the Skykomish River

The Skykomish River channel immediately below the Skykomish River Bridge ranges from approximately 150 to 250 feet wide. The channel gradient in this area averages approximately 27 feet per mile. The channel contains mostly glide habitat, with occasional riffles at lower flows. Larger sections of riffle are present approximately 2,900 feet downstream of the existing levee. Substrate within the channel varies in size from large boulders and cobbles to smaller gravels and sands. Larger boulder substrates are more frequent along the northern portions of the channel, with smaller cobbles, gravels, and sands occurring on a gravel bar adjacent to the southern shore.

Low-velocity shoreline habitat, which provides refuge for migrating juvenile salmonids, is present along the base of the existing levee throughout much of the site. The larger riprap and boulders present along this shoreline reduce flow velocities near the bank by creating eddies where water flows around these larger substrates. Low-velocity areas are also present within the interstices of the larger boulders and riprap.

However, natural low flows within the Snohomish River basin, particularly during the summer months, may limit fish access to low-velocity shoreline habitat areas. These natural low flows may also limit access to pockets of spawning gravels, while also potentially dewatering redds.

Overhanging vegetation present along the shoreline offers refuge from predators for juvenile fish, while helping to reduce water temperatures and increase water quality. In addition, overhanging vegetation provides a food

source for juveniles through the deposition of detritus, which is a primary food source for aquatic insect larvae.

Aquatic habitat features present near the site include boulder substrates that provide refuge from high flows, large woody debris that provides refuge from predators, and large holding pools for migrating fish. The Biological Assessment being prepared for the project will describe the aquatic habitat present in the South Fork of the Skykomish River in greater detail.

Former Maloney Creek Channel

The culvert that connects to the downstream segment of the former Maloney Creek channel (wetland) is passable to adult salmonids during flowing periods, as they have been observed at various locations upstream of the culvert (Ecology, 2002b). The channel within the wetland is undefined throughout most of its length, with surface sediment layers dominated by sands and silts overlain with varying amounts of organic debris. Ponding occurs throughout this area. The wetland contains several aquatic habitat features including an invertebrate food source and shading provided by dense canopy cover. Canopy vegetation is dominated by second-growth deciduous trees.

As mentioned above, the Biological Assessment being prepared for the project will discuss the aquatic habitat near the site in more detail.

2.2.6.2 Threatened and Endangered Species

Historically, Sunset Falls presented a barrier to the upstream migration of anadromous fish in the South Fork of the Skykomish River. Anadromous fish access to the upper South Fork has only been possible since 1952, when a trap and haul operation was commenced by the Washington Department of Fisheries at Sunset Falls (DEA, 1999).

Two threatened or endangered species of fish occur in the South Fork of the Skykomish River: Puget Sound chinook salmon (*Oncorhynchus tshawytscha*) and bull trout (*Salvelinus confluentus*). Juvenile chinook would be expected to be present within the South Fork of the Skykomish River near the Town of Skykomish from mid to late February through May. Juvenile bull trout rear in their natal headwater streams, and are not expected to be present within the South Fork. As mentioned above, water levels within the South Fork at this time are such that the shoreline edge habitat is available to juvenile salmonids.

This section only describes Threatened and Endangered species. Coho, a federal candidate species, is discussed below in the section entitled Other Fish.

Chinook

Puget Sound chinook salmon are listed as threatened by the National Marine Fisheries Service (NMFS). They utilize the South Fork of the Skykomish River for spawning, migration, and rearing from the confluence with the North Fork Skykomish River, up to Sunset Falls (WDFW and WWTIT, 1994). Spawning in the upper South Fork basin occurs in suitable mainstem reaches, as well as the lower reaches of larger tributaries, including the Miller, Beckler, Tye, and Foss Rivers (Pentec and NW GIS, 1999).

Chinook life history, presence, and habitat use in the South Fork of the Skykomish River will be discussed in more detail in the Biological Assessment being prepared for the project.

The chinook stock present within the South Fork of the Skykomish River basin is the Bridal Veil Creek fall chinook, which typically spawn from late September through October (USFS, 1999). Juvenile emergence occurs from February to mid-March (Pentec and NW GIS, 1999). Chinook rear in freshwater habitats from several months to a year before emigration.

As described in Section 2.2.2, the substrates within the South Fork of the Skykomish River near the site are dominated by cobbles, with larger cobbles and boulders also present; therefore, large areas of suitable chinook spawning habitat is not likely to be present. However, small pockets of spawning gravels may be present near the site. The nearest large spawning riffle for Chinook is located approximately 2,900 feet downstream of the site. Overhanging riparian vegetation, which is present along the existing levee, provides many important habitat functions for juvenile salmonids (Meehan et al., 1977). Particularly, it increases the quality of the low-velocity shoreline edge habitat for juvenile salmonids by providing refuge from predators, decreasing water temperatures, and increasing production of food resources.

As mentioned in Section 2.2.2, low-velocity river margin areas are present along the base of the levee, containing areas of deeper water adjacent to the shoreline. Flows within the South Fork are typically high enough for juvenile salmonids to utilize this habitat from September to July. In July, the flows decrease to the point where the shoreline edge habitat is dewatered. However, at that time it would be expected that any juvenile salmonids still present would be large enough to occupy areas within the mainstem with higher velocities.

Shoreline edge habitat consisting of larger riprap and boulders offers rearing and refuge habitat to juvenile salmonids, including chinook (Pentec and NW GIS, 1999). The larger substrates slow water velocities near the margins of the streams, allowing juveniles to use these areas for refuge from both high flows and predation, as well as sources of food (Pentec and NW GIS, 1999).

Bull Trout

Bull trout are also listed as threatened by the NMFS. Bull trout in the upper South Fork of the Skykomish River basin exhibit three life history strategies: anadromous (migratory between saltwater and freshwater), fluvial (migratory within river systems), and resident (non-migratory). Bull trout present near the Town of Skykomish are predominantly anadromous, and utilize the South Fork as a migratory corridor, traveling upstream to spawning grounds on the lower East Fork Foss River. However, fluvial and resident bull trout may also be present near the site. Bull trout are opportunistic feeders that prey on a wide variety of organisms. Juveniles utilize terrestrial and aquatic insect larvae, zooplankton, amphipods, and various other invertebrates as a food source. Adults and sub-adults typically feed on juvenile salmonids, sculpin, and whitefish.

Bull trout require cold, clear water and loose, clean gravels for spawning, and prefer habitat with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (WDFW, 1997b). Spawning reaches must contain clean gravels over larger cobbles, with a very low quantity of fines. Bull trout spawning typically occurs from late August through early November, commencing when water temperatures drop below 46 °F (WDFW, 1998). Preferred bull trout spawning habitat is not likely to be present in the South Fork of the Skykomish River or the former Maloney Creek channel.

Fry typically emerge from the gravel from January through March and April, with juveniles remaining close to their natal headwater areas while rearing (Pentec and NW GIS, 1999). Anadromous bull trout generally leave headwater areas as 2-year olds and migrate to estuarine waters during the spring. During this migration, bull trout are large enough that they do not depend on the low-velocity river margins present within the South Fork.

In addition to bull trout, Dolly Varden (*Salvelinus malma*), a closely related species, may also be present near the site. Dolly Varden exhibit the same life history strategies and habitat requirements as bull trout (WDFW, 1998).

As mentioned above, bull trout life history, presence and habitat use in the South Fork of the Skykomish River will be discussed in more detail in the Biological Assessment being prepared for the project.

Other Fish

There are several other species of fish that may occur in the upper South Fork of the Skykomish River, including coho (*O. kisutch*), pink (*O. gorbuscha*), and chum (*O. keta*) salmon, steelhead (*O. mykiss*) and coastal cutthroat trout (*O. clarki clarki*), pacific lamprey (*Entosphenus tridentatus*), river lamprey (*Lampetra ayresi*), and mountain whitefish (*Prosopium williamsoni*). These species are not listed as threatened or endangered.

The juveniles of the salmonid species would be expected to utilize the shoreline edge habitat of the South Fork of the Skykomish River upon emergence. Juvenile coho, pink, and chum salmon typically emerge from the gravel from late February and early March through April and May. The low-velocity shoreline edge habitat of the South Fork would be used by these species. However, pink and chum generally migrate to estuarine waters immediately after emergence, and would likely only be present for a very short period.

The following describe these other salmonids. Table 2-3 summarizes salmonid presence and timing within the South Fork of the Skykomish River near Skykomish, as well as the former Maloney Creek channel.

- **Coho Salmon.** Coho utilize the South Fork as migratory, rearing, and spawning habitat, generally spawning from late October through January (Pentec and NW GIS, 1999). Coho spawning grounds include appropriate areas of the mainstem South Fork, as well as the lower reaches of Miller, Beckler, Foss, and Tye Rivers. Coho have also been observed in Maloney Creek (White, 2003). They typically prefer spawning habitat similar to chinook; as such, coho spawning habitat is unlikely to be present within the South Fork near Skykomish.

Coho generally emerge from the gravel from March through May (Pentec and NW GIS, 1999). As with chinook, they would likely utilize the low-velocity shoreline habitat in the South Fork of the Skykomish River from March until June and July while migrating downstream in search of appropriate off-channel rearing habitat.

The former Maloney Creek channel area contains small, quiet pools with large amounts of organic detritus, which likely offer quality rearing habitat for coho. Coho have been observed in the former Maloney Creek channel, as well as in the main channel of Maloney Creek (Ecology, 2002b).

- **Pink Salmon.** Pink salmon spawn in the upper South Fork basin from mid-September through October in odd-numbered years only, utilizing the mainstem South Fork as well as the Beckler River (Pentec and NW GIS, 1999). Pink salmon have also been documented in Maloney Creek (White, 2003). Pink salmon generally prefer smaller cobbles and gravels for spawning, and therefore would not likely spawn near the site.

Pink salmon fry emerge from the gravel in March through April, and immediately begin their migration to estuarine waters. Pinks generally only reside in fresh water for 1 to 2 weeks, depending on

the length of their seaward migration (Pentec and NW GIS, 1999). However, they may occasionally utilize river shoreline edge habitat for rearing during their migration.

- **Chum Salmon.** Chum salmon are known to spawn in the mainstem Skykomish River as far upstream as Gold Bar (Pentec and NW GIS, 1999). Chum salmon in this area generally spawn from mid-November through mid-January. Spawning information for the upper South Fork of the Skykomish River is scarce, but adult chum have been recorded in the lower reaches of Maloney Creek (Ecology, 2002b). Chum likely spawn in appropriate mainstem reaches along the South Fork of the Skykomish, as well as the lower reaches of larger tributaries. Because of their larger size, chum have similar spawning habitat requirements as chinook. As such, suitable spawning habitat for chum is not likely to be present in the vicinity of the site area.

Chum fry emerge from the gravel in the spring, usually from February and March into May (Pentec and NW GIS, 1999). As with pink salmon, chum typically do not rear in freshwater, usually residing in freshwater for only a couple of weeks. Limited use of South Fork mainstem rearing habitat may occur during their estuarine migration.

- **Steelhead.** Steelhead use the upper South Fork basin and its tributaries for spawning, rearing, and migration. Summer steelhead spawn from February to April in the lower reaches of Miller, Foss, and Tye Rivers, while winter steelhead spawn from early March to early to mid-June in the lower reaches of Miller, Beckler, and Foss Rivers (Pentec and NW GIS, 1999). Steelhead prefer fast-moving, higher gradient reaches with larger substrates for spawning (WDFW, 1997a). Therefore, the habitat present within the South Fork near Skykomish likely does not contain suitable spawning habitat for steelhead.

Juvenile steelhead typically emerge from the gravel from June through August. Juvenile steelhead primarily utilize mainstem habitat for rearing, typically overwintering for 2 or more years before emigrating to saltwater (Pentec and NW GIS, 1999). They prefer fast-moving water with larger substrates for rearing, utilizing the areas behind larger cobbles and boulders (WDFW, 1997a). As their emergence time generally corresponds with lower flows and dewatering of the shoreline edge within the South Fork, steelhead likely utilize this habitat for only a short period of time before moving to faster waters.

- **Coastal Cutthroat Trout.** Anadromous coastal cutthroat trout are generally not found above the town of Gold Bar in the Skykomish River (WDFW, 2000). Coastal cutthroat typically prefer slower-moving, lower-gradient streams, and therefore would not likely be found in the mainstem South Fork Skykomish River near the site (Pentec and NW GIS, 1999).

Fluvial cutthroat trout may be present in limited numbers within the mainstem South Fork and Maloney Creek (WDFW, 2000). Fluvial cutthroat present in mainstem rivers generally migrate upstream to spawn in smaller tributaries and side channels. Fluvial cutthroat in the Snohomish Basin spawn from January through mid-June. Juveniles emerge from the gravel within eight to nine weeks, and generally seek out slow-moving side channels and tributaries (WDFW, 2000).

In addition to the salmonids described above, several other species of fish may be present near the site. Pacific lamprey and river lamprey are both listed as Federal Species of Concern, with river lamprey also listed as a State Candidate species by WDFW (WDFW, 2003c). Both species spawn in gravel in clear streams, with ammocoetes developing in mud, silt, and sand substrates at the bottoms of pools and backwater eddies. In addition, mountain whitefish (*Prosopium williamsoni*), which is listed as a State Species of Concern, may also be present near the site (WDFW, 2003c). Mountain whitefish prefer fast, clear or silty streams, feeding primarily on aquatic insect larvae, mollusks, fish, and fish eggs (Froese and Pauly, 2003).

2.3 Built Environment

This section describes land use plans, public services, environmental health considerations, and transportation. The town and site are described in Section 2.1.

2.3.1 Land and Shoreline Use Plans

This section describes how the Town of Skykomish is zoned in the subsection called Zoning Ordinances. It also describes the CAO, which includes information on shoreline use. Finally, this section describes the housing and demographics of the Town of Skykomish and the aesthetic and historical structures.

2.3.1.1 Zoning Ordinance

The Town of Skykomish is a rural town and is surrounded on all sides by the Mt. Baker-Snoqualmie National Forest. It is divided into five zoning districts: residential, commercial, industrial, historic commercial, and public (Ordinance 235, 1995). The industrial zone of Skykomish consists of the

railyard. The historic commercial zone lies north of the railyard along Railroad Avenue between 4th and 6th Streets. There are commercial zones on the north bank of the South Fork of the Skykomish River and south of the railyard.

The remainder of the town is residential with the exception of the public buildings, such as the school, community center, and town hall. There is a public park outside of the city limits on the north side of the South Fork of the Skykomish River, as described below.

The majority of businesses in Skykomish are small retail but also include gas stations, motels, and hotels that cater to local residents and tourists (Town of Skykomish, 1993). Besides the BNSF railroad maintenance activities, there is no other industry in Skykomish. The National Forest Service maintains a depot in Skykomish (Figure 2-16).

The site includes land in each of the five zoning areas, as shown on Figure 2-17. The site includes the historic commercial zone in the downtown area, most of the industrial zone, and most of the public zone. The site covers approximately 230,000 square feet of residential land.

2.3.1.2 Critical Areas Ordinance

A CAO (Ordinance 269, 1998) for the town was adopted by the town council in 1999. The CAO was adopted to designate and classify environmentally sensitive and hazardous areas, including wetlands, fish and wildlife habitats, flood hazard areas, geologic hazard areas, and aquifer recharge areas. The CAO regulates alterations in and adjacent to critical areas to protect natural resource values, public resources and facilities, and public safety. The CAO also meets the requirements of the Washington Growth Management Act (RCW 36.70A) with regard to the protection of critical areas and the Shoreline Management Act (RCW 90.58) with regard to protecting shorelines. The CAO is used to coordinate environmental review and permitting of proposed actions affecting critical areas.

Areas protected under the CAO include the former Maloney Creek channel and wetland, Maloney Creek, and the South Fork of the Skykomish River. The South Fork of the Skykomish River and Maloney Creek meet the definition of Primary Fish and Wildlife Habitat. The former Maloney Creek channel and wetland are ranked for this evaluation as secondary fish and wildlife habitats, based on the absence of documented federal and/or state-listed species. The former Maloney Creek channel and wetland are shown on Figure 2-1. The site of the Skykomish River is considered a “shoreline of statewide significance” with the receipt of water from Beckler Creek, just upstream of the town (WAC 173-18-20).

Areas within the 100-year floodplain are defined as Flood Hazard areas under the CAO. The 100-year floodplain associated with the Skykomish River and Maloney Creek may be seen on Figure 2-9, and is discussed in more detail on Section 2.2.2 under the title “Floods.”

The CAO is also the primary regulation applicable to management of activity in and around shorelines. The requirements of the CAO must be met in order to receive a Shoreline Conditional Use permit, a Shoreline Substantial Development permit, or a Shoreline Variance.

2.3.1.3 Housing and Demographics

The majority of housing units in Skykomish are single-family residences (U.S. Census Bureau, 2001). Twenty-six residences lie within the footprint of the site. Some of the residences in Skykomish are mobile homes and approximately one-third of these are used as seasonal residences. The commercial buildings are predominantly small retail but also include gas stations, a church, motels, and hotels that cater to local residents and tourists (Town of Skykomish, 1993). There are 10 commercial buildings on the site.

The most recent census (U.S. Census Bureau, 2001) reports 214 people living in Skykomish of which 29 (13 percent) are under the age of 19. It is estimated that up to 30 seasonal residents live in Skykomish at any time of the year (Dohran, pers. comm., 2003). The decline of the railroad as a primary form of transportation resulted in the loss of railroad-related jobs in Skykomish. Now the USFS is the major employer in Skykomish. Since automotive use has increased, residents of Skykomish have been able to commute to major employment centers and Skykomish has become more accessible to seasonal residents and visitors. The economy of Skykomish is now dependent on tourism and the USFS (Town of Skykomish, 1993).

2.3.1.4 Aesthetics and Historical Structures

Scenic resources in Skykomish include the historic commercial district and the Mt. Baker-Snoqualmie National Forest near the town. The Skykomish School and Teacherage, Maloney’s General Store, the Masonic Lodge, and the Skykomish Depot are defined as landmarks of significance of Skykomish and King County. Both Maloney’s General Store and the Skykomish depot are listed on the National Register of Historic Places (Skykomish Historical Society). Several of these historic structures are located within the site.

2.3.2 Public Services

This section describes the public services that the Town of Skykomish provides to its citizens. These include schools, parks and recreation, and utilities. In addition, Skykomish provides the following services:

- Fire fighting services through a contract with King County Fire District No. 50. The location of the fire station is provided on Figure 2-16.
- Police protection through a contract with the King County Sheriff (Yates, 2003b).
- Road maintenance including snow plowing and repairing of road surfaces (Yates, 2003b).

The nearest hospital to Skykomish is approximately 40 miles away in Monroe, Washington.

2.3.2.1 Schools

There are no private or charter schools in Skykomish. The Skykomish Elementary and High Schools of School District 404 are located at 105 Sixth Street (Figure 2-16). There are 70 students enrolled in grades K-12 for the 2002–2003 school year. In general, the enrollments of the Skykomish Schools are decreasing. The School District stretches from Index in Snohomish County to the eastern side of Stevens Pass. School buses bringing students to school enter the Town of Skykomish on 5th Street, take a right on Railroad Avenue, and then a right onto 6th Street. The buses turn left at the three-way intersection at the end of the block and turn around (Moore, 2003).

2.3.2.2 Parks and Recreation

Skykomish has one small community park that is south of U.S. Highway 2 and north of the South Fork of the Skykomish River. Access to the park, which includes a baseball diamond, lies approximately half a mile east of the 5th Street Bridge over the Skykomish River. Other nearby recreational facilities include the South Fork of the Skykomish River and neighboring National Forest lands. There are no trailheads or camping grounds within the Town of Skykomish limits nor is there public access to the river on or near the site, although the public can access the river using a path just north of the Skykomish River Bridge across the Skykomish River.

2.3.2.3 Utilities

There are no municipal storm or sanitary sewer systems or wastewater treatment plants in Skykomish. Residents use septic systems consisting of tanks and leach fields to treat and dispose of sanitary waste. The people of Skykomish are served by two public water supply wells that are located about 1,100 feet east (upgradient) of Skykomish, as discussed in Section 2.2.2.

2.3.3 Environmental Health

In this section describes how the built environment of the Town of Skykomish could affect environmental health. Noise, vibrations, and hazardous substances are all factors that could affect environmental health.

2.3.3.1 Noise

Noise can be defined as unwanted sound that is disturbing or annoying. Sound can be objectionable due to pitch or loudness. Pitch depends on the frequency of vibrations that produce the sound. Loudness is the intensity of sound waves. Decibels (dB) measure the relative amplitude of sound. The decibel scale is logarithmic, meaning that an increase of 10 decibels is a ten-fold increase in acoustic energy. The A-weighted sound level (or dBA) gives greater weight to sound frequencies to which the human ear is more sensitive, as shown on Figure 2-18. Table 2-4 gives descriptions of different levels of sound. Since environmental sounds are often made up of time-varying events, most environmental sounds are described using an average level that has the equivalent acoustical energy as the summation of all the time-varying events.

Noise attenuates in the atmosphere as a function of distance between the receiver and the source. Typically noise is reduced 6 dB for every doubling in distance. Additionally noise is attenuated by intervening structures.

The two main sources of noise in Skykomish are the BNSF railroad that passes through town and traffic along U.S. Highway 2. Stationary idling locomotives exceed 85 dB (the occupational limit) at 30 feet (Union Pacific Railroad, 1999) while a train traveling 30 to 40 miles per hour produces 88.7 dB of noise at a distance of 100 feet (RETEC, 2003c). Approximately 24 trains pass through Skykomish on average each day, but do not regularly stop and idle in town.

2.3.3.2 Vibrations

Train traffic passing through Skykomish is the only significant source of vibrations on a regular basis.

2.3.3.3 Hazardous Substances

The most significant risk of explosion or new releases to the environment on the site is an accident on the railroad or highway. There is an existing potential of exposure to hazardous substances from the subsurface contamination that is being addressed in this FS/EIS. In addition, heating oil is used throughout the town and is stored in underground storage tanks throughout the town. The school also has a diesel boiler.

2.3.4 Transportation

This section describes roads, transportation systems, and traffic through Skykomish.

2.3.4.1 Roads and Transportation Systems

There is no public transportation within Skykomish or to Skykomish now that the railroad no longer stops at the depot in town. U.S. Highway 2 is a federal highway. U.S. Highway 2 goes west from Skykomish to Everett, Washington, and east from Skykomish to Chelan, Washington. Figure 1-1 shows U.S. Highway 2 and Figure 2-16 shows roads in the town.

The Washington State Department of Transportation (WSDOT) maintains the steel truss bridge into town from U.S. Highway 2. The bridge is 102 feet long with 10 feet of clearance (Department of Highways, 1938). There are no posted load restrictions on the bridge.

There are about 3.3 miles of local predominantly asphaltic concrete roads in Skykomish (Town of Skykomish, 1993).

2.3.4.2 Traffic

The average annual daily traffic count for U.S. Highway 2 north of town is approximately 4,750 vehicles (Taylor, 2003). There is limited traffic within Skykomish itself and there are no traffic lights.

2.4 Interim Cleanup Actions and Ongoing Site Maintenance

This section describes the interim cleanup actions and ongoing maintenance of them at the site.

2.4.1 Barrier System

In August 2001, a barrier system was constructed along the West River Road at the site. The barrier system consists of a 600-foot cement-bentonite slurry wall constructed to a depth of 15 feet bgs, and recovery wells. The purpose of the barrier system is to contain and recover free product migrating to the Skykomish River. Free product was present within the levee downgradient of the wall when the barrier system was installed and is being recovered to extent feasible with booms and pads, as described in Section 2.4.2. The barrier wall and booms are not designed to contain all hydrocarbons dissolved in groundwater.

The wall is positioned along West River Road adjacent to the levee. This location was selected to intercept oily seeps and thereby minimize risk to human health and the environment. The length and configuration of the wall

is based on the location of product seeps and the free product plume. Because the wall alignment is not perpendicular to the groundwater flow direction, wing walls were constructed for extra protection against free product flow around the downgradient end of the wall and to enhance product recovery throughout the recovery zone (area immediately upgradient of the wall). The barrier wall extends deeper than historical low water levels of about 10 feet bgs. This ensures containment of free products but is not designed to capture petroleum dissolved in groundwater that may migrate beneath and around the wall.

Recovery wells have been installed upgradient from the barrier wall. These wells are screened across the water table and are 6- or 8-inch diameter, stainless steel wells with a 20 slot wire-wound screen. These have been gauged on a monthly basis and skimmer pumps have been installed and are operational in those wells in which free product has been accumulating. The free product is pumped from the wells into subsurface vaults. These vaults are evacuated, as necessary. Figure 2-19 shows the configuration of the recovery wells and barrier wall. The free product between the river and the barrier wall was there prior to the barrier wall construction. This is an ongoing source of free product to the river and is being recovered to extent feasible with booms and pads, as described in Section 2.4.2. Further details are provided in the *Interim Action Completion Report* (RETEC, 2001) and *Phase 2 Interim Action Completion Report* (RETEC, 2003d).

2.4.2 Oil Recovery Booms

Seeps of free product have been observed on the southern bank of the South Fork of the Skykomish River downstream of the Skykomish Bridge. The source of these seeps is free product that was present downgradient of the barrier wall when the barrier system was installed. The oil seeps consist of a dense, thick, heavyweight product with a viscosity similar to bunker C fuel oil. The specific gravity is slightly less than one, thus the product floats to the water surface. Product has been observed in the form of sheens or occasional globules up to 0.5 inch in diameter seeping out of the riverbank with groundwater. To mitigate such seeps while completing the RI/FS, BNSF implemented the boom deployment and mitigation program, described in the Interim Action Plan (RETEC, 1995) and *Boom Maintenance Technical Memorandum* (RETEC, 2002b). Boom deployment and maintenance supplements the oil recovery system and subsurface barrier wall. The current boom maintenance program entails placing oil-absorbent booms along the riverbank year round at the seep locations. These booms are inspected regularly and are replaced, as needed. Single or multiple rows of boom have been used for the free product recovery. Further details are provided in the *Boom Maintenance Technical Memorandum* (RETEC, 2002b).

2.4.3 Dust Suppression Application

Currently, the dust suppressant Soil Sement[®] is being used at the site to control dust and erosion. Soil Sement[®] is an environmentally safe non-hazardous polymer emulsion that bonds surface dust and aggregate together into a hard, dust-free, and water-resistant surface. The sealant is applied to reduce dust generation from areas of the railyard that contain elevated concentrations of lead and arsenic. The purpose of the interim action of applying the sealant is to minimize human environmental exposure to the contaminants (lead, arsenic) through direct contact and windblown dust.